

Chapter 6 Equipment Cabinets

Equipment cabinets are installed along the freeway as part of the FMS project. Equipment cabinets are typically located adjacent to mainline detector stations, ramp meters (generally shared with the mainline detector stations), CCTV installations (select sites), and freeway DMS. When conditions during the initial roadway construction make it difficult or impossible to install an equipment cabinet or foundation at a later time, the provision for the equipment cabinet, or as a minimum, the equipment cabinet foundation, should be made as part of the initial roadway construction. This chapter describes considerations for cabinet location and key provisions for cabinet foundations.

6.1 Equipment Cabinet Location

Design criteria for suitable controller cabinet location include the following:

- A. The cabinet is to be placed in the safest possible location, generally along the right shoulder, and to minimize conduit and cable quantities. If no protection (e.g., barrier or guardrail) is proposed for the cabinet location, the cabinet shall be outside the *clear zone* such that no protection is needed. See the *AASHTO Roadside Design Guide* for *clear zone* requirements. If the cabinet must be placed between the mainline and the ramp and an adequate clear zone is not met, protection is to be provided, as required. Consideration should also be given to probable future widening of the mainline and/or ramps, and consequently any opportunity to install cabinets further from the edge of the traveled way should be considered.
- B. If a barrier is present along the right edge of the pavement and the installation of a controller cabinet is required, the cabinet is to be located a minimum of six feet behind a guardrail and a minimum of one foot behind a concrete barrier.
- C. The cabinet is to be located in order to minimize the length of the detector loop lead-in while also considering probable future widening of the mainline and/or ramps. Loops from several different locations will be terminated in the cabinet: the ramp metering stop bar area, the advance queue detector (AQD) area, and adjacent mainline loops. The cabinet is to be within 540 feet of all mainline and ramp loop detectors, measured along the wire path, and within 700 feet of the AQD loop detector. Where non-intrusive detection system technology is used instead of loops, the designer must check with the vendor to determine distance limitations. Visibility from the cabinet to the specific detection system is to be maintained for ease of calibration and maintenance.
- D. Modifications in the landscaping plan may be required on new projects to include a safe maintenance vehicle parking area and to ensure visibility of the FMS equipment.
- E. The position of a combined ramp meter/mainline detector station cabinet is to allow observation of the ramp metering stop bar and at least one ramp meter signal head from the doorway of the cabinet.

6.1.1 Ramp Metering Cabinets

Designers are advised to refer to the *ADOT Ramp Meter Design, Operations, and Maintenance Guidelines* for guidance on ramp metering concepts. Where ramp metering equipment is not being

installed at the time of roadway design, the future cabinet site shall be located per Figures 4.1, 4.2, and 4.3.

Essentially, all infrastructure should be installed as part of the roadway design to avoid costly retrofit work at the time the ramp metering is implemented.

6.1.2 Other Equipment Cabinets: CCTV, DMS, Mainline Traffic Monitoring

Locations for non ramp-metering cabinets are dependent on the location of each device served. Ideally, positions for CCTV, DMS, and mainline traffic monitoring stations (besides those associated with ramp meters) are established in the initial design for all FMS projects, including those where only the conduit, pull boxes, and foundations are initially constructed. Device positions then determine cabinet and No. 9 pull box locations. Typically, the No. 9 pull box is positioned laterally from each cabinet.

6.2 Equipment Cabinet Foundation

The contractor is required to provide a cabinet foundation field marking for approval by the engineer prior to construction of each cabinet foundation. The engineer will verify that the marked foundation location is consistent with the location of the trunkline pull box and the device served by the cabinet, as these locations may have also been adjusted. The engineer will also verify that the location of the cabinet foundation is in a safe position, has acceptable maintenance access, and is not in a swale.

All equipment cabinet foundations shall be numbered and geo-referenced. Each equipment foundation on each FMS project shall be designated with a unique number that is not duplicated. The numbering scheme should follow the typical ADOT cabinet numbering scheme, e.g., by route, direction, and milepost to the nearest hundredth of a mile.

Designer's special provisions must include the "as-built documentation" bid item. As part of this bid item description, the special provisions shall require the Contractor to provide GPS coordinates for each new and existing equipment cabinet/or foundation within the project limits. GPS devices should not be a bid item unless otherwise directed by ADOT TTG. The designer will need to coordinate with ADOT TTG on the GPS data collection and format requirements. The designer's plans need to provide placeholders for the Contractor to fill in coordinates to record as-built information.

6.2.1 Foundation Enhancements for Fiber-Optic Cable Connectivity

The cabinet foundation shall include a recess below the top of the cabinet foundation, called the *Dooley Sump*, as shown in Figure 6.1. The *Dooley Sump* contains a cabinet fan out kit and fiber patch mounting bracket as shown in Figure 6.2. All unused connector coupler ports shall be covered to avoid any contamination or debris from entering the exposed port. The purpose of the *Dooley Sump* is to reduce or eliminate damage to fiber-optic communications infrastructure by allowing the cabinet to shear without breaking the fiber-optic branch cable in the event that the cabinet is knocked down by a vehicular collision or other cause.

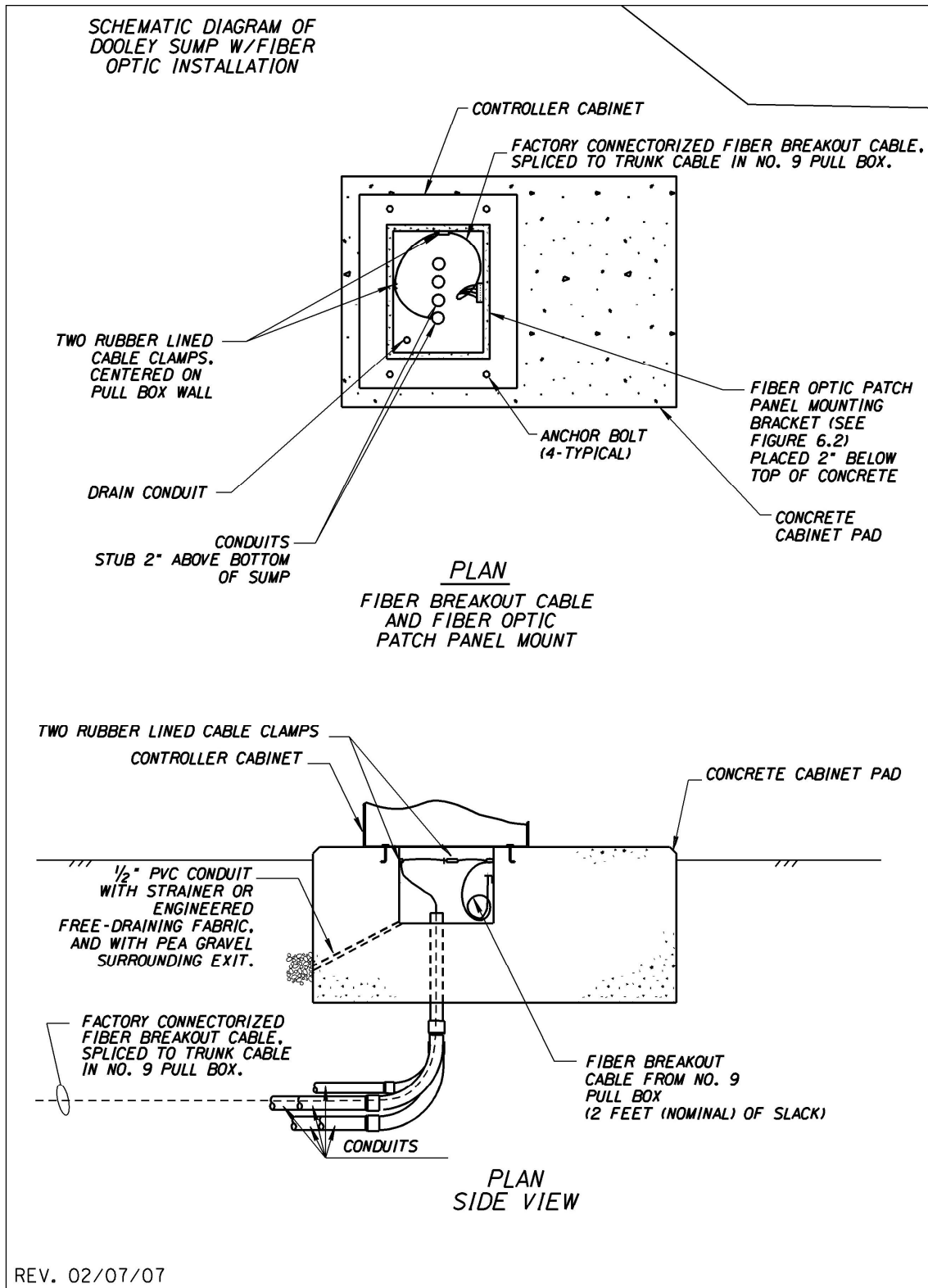


Figure 6.1 Cabinet Dooley Sump Detail

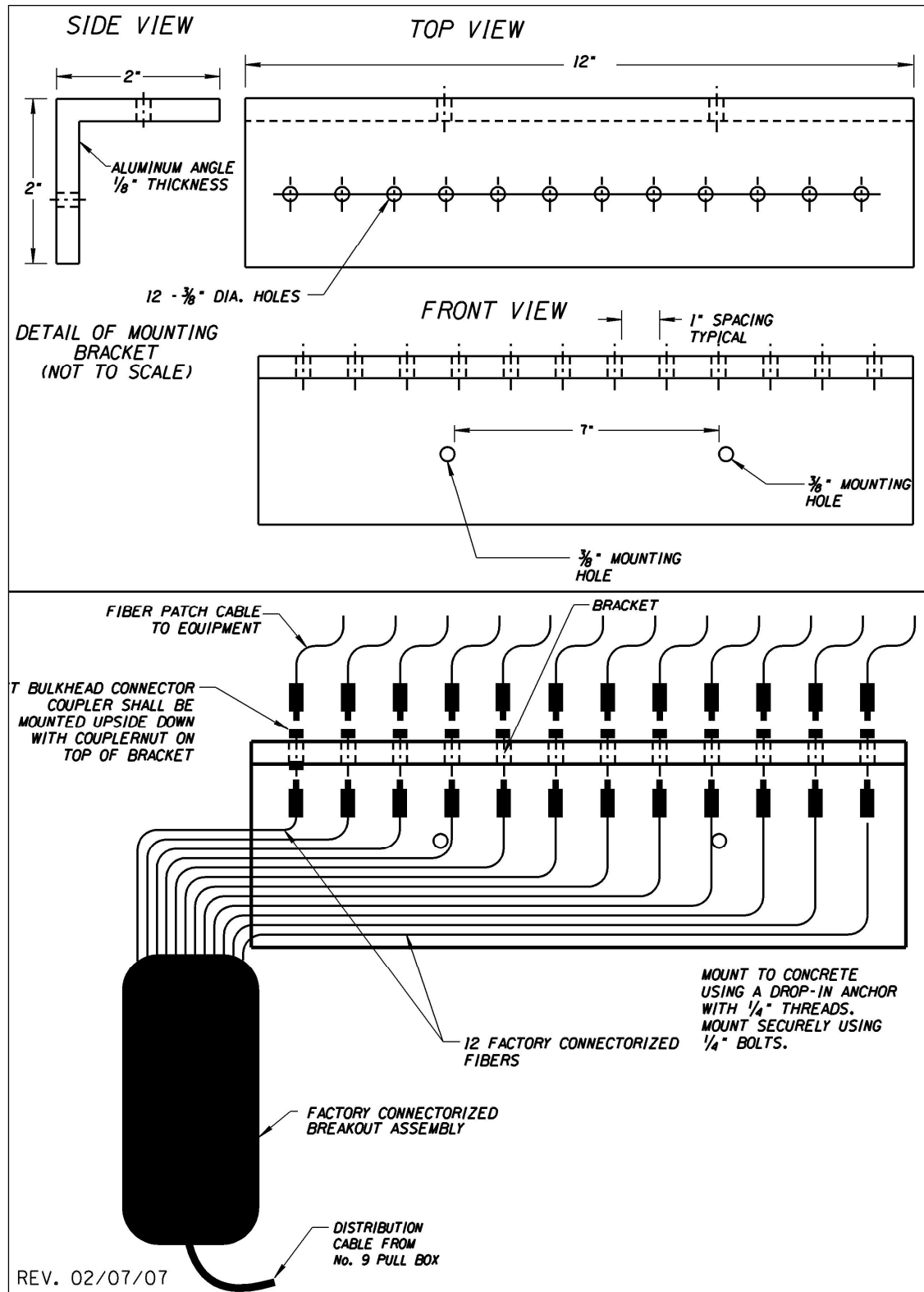


Figure 6.2 Cabinet Fan Out Kit and Fiber Patch Mounting Bracket Detail

6.3 Equipment Cabinet Power and Surge Protection

All cabinets shall be grounded in accordance with *NEC* standards. CCTV cabinets and poles in the past have been protected with an air terminal at the top of the pole; the FMS designer shall coordinate with the ADOT TTG PM on the current surge protection requirements for the CCTV cabinets and poles. Surge protectors shall be used where appropriate.

For certain cabinets (i.e., stand alone ramp meter), 120-volt power is generally available within a reasonable proximity. However the designer should size the conductors to comply with *NEC* requirements (voltage drop for feeder circuits, *NEC 215-2(d) FPN No. 2*; voltage drop for branch circuits, *NEC 210-19(a) FPN No. 4*) and a maximum 5% voltage drop based upon the design load.

For FMS system implementation, 480-volt power is generally distributed from a load center to each equipment cabinet and stepped down from 480 volts to 120 volts with a step-down transformer located adjacent to the cabinet. A type IV load center cabinet is preferred because it offers the opportunity for both voltage types. Conductor wires shall be size #2 or smaller for FMS applications, #4 or smaller is preferred.

6.3.1 Transformer Cabinet Power Disconnect

All transformer cabinets shall be equipped with an external power disconnect as shown in Figure 6.3.

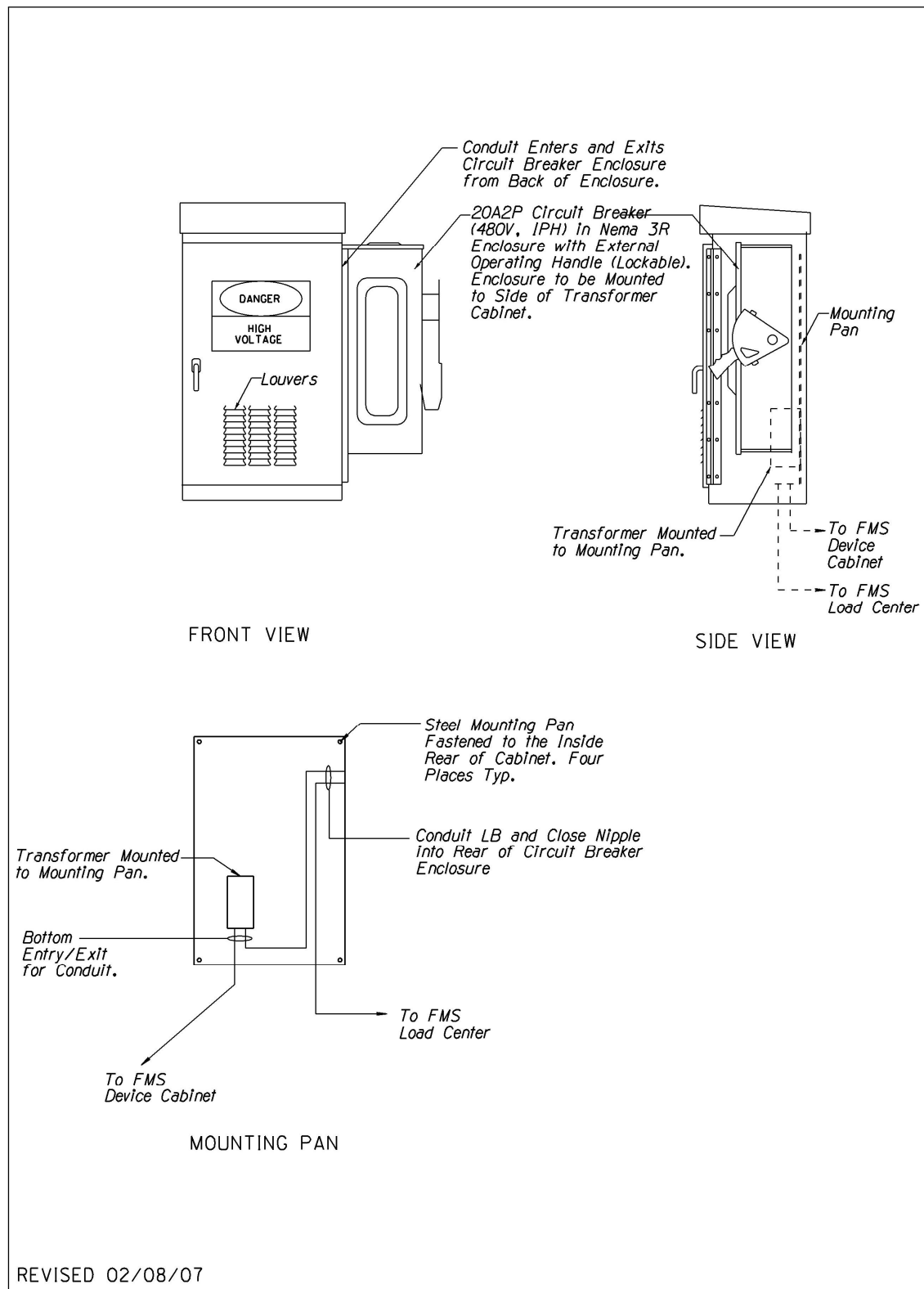


Figure 6.3 Transformer Cabinet Power Disconnect